

**REMARKS**

Initially, Applicant expresses appreciation to the Examiner for the detailed Official Action provided. Furthermore, Applicant expresses appreciation to the Examiner for the acknowledgment of Applicant's Claim for Priority and Receipt of the certified copy of the priority document.

Upon entry of the present paper, claims 12, 14, 16, and 18 will have been amended, claim 19 will have been added, and claims 13 and 15 will have been cancelled. The herein-contained amendments should not be considered an indication of Applicant's acquiescence as to the propriety of the outstanding rejection. Rather, Applicant has amended the claims in order to advance prosecution to allowance. Furthermore, no prohibited new matter has been introduced by the abovementioned amendments. Specifically, claims 12 and 18 have been amended to generally incorporate the subject matter of cancelled claims 13 and 15, while new claim 19 is submitted to be supported at least by Figures 6C and 6D of the present application. Thus, upon entry of the present paper, claims 12, 14, 16, and 18-19 are pending in the present application, with claims 12 and 18 being in independent form.

Applicant addresses the objection and rejections provided within the Official Action below and respectfully requests reconsideration and withdrawal of the outstanding objection and rejections together with an indication of the allowability of claims 12, 14, 16, and 18-19 (*i.e.*, all pending claims) in the next Official communication. Such action is respectfully requested and is now believed to be appropriate for at least the reasons provided below.

### **Objection to the Abstract**

In the outstanding Official Action, the Abstract of the Disclosure was objected to as containing two paragraphs.

Upon entry of the present paper, a new, substitute Abstract of the Disclosure will have been submitted which contains a single paragraph, and which is also within the 150 word requirement. Thus, Applicant submits that the grounds for the above-captioned objection no longer exist and respectfully requests withdrawal thereof in the next Official communication.

### **Objections to the Drawings**

In the outstanding Official Action, the drawings were objected to. Specifically, Figures 1-3 were objected to as failing to be designated by a "Prior Art" legend.

Upon entry of the present paper, two replacement sheets for drawing Figures 1-4 will have been submitted in which Figures 1-3 have been amended to include a "Prior Art" legend. Thus, Applicant submits that the grounds for the above-captioned objection no longer exist and respectfully requests withdrawal thereof in the next Official communication.

### **35 U.S.C. § 103 Claim Rejections**

Claims 12-16<sup>1</sup> were rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Pat. Appl. Pub. No. 2003/0071271 to Suzuki et al. (hereinafter "SUZUKI") in view of Japanese Pat. Pub. No. 2001-108812 to Tamechika et al. (hereinafter "TAMECHIKA").

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<sup>1</sup> Applicant notes that the rejection indicates that claims 11-16 are rejected under 35 U.S.C. § 103 but that the Examiner confirmed, in a telephone discussion on November 25, 2009, that claim 12 of the present application was inadvertently referred to as claim 11 in the outstanding Official Action.

Upon entry of the present paper, without acquiescing in the propriety of the rejection and solely to expedite prosecution of the present application to allowance, independent claim 12 will have been amended to generally incorporate the subject matter of dependent claims 13 and 15 (and dependent claims 13 and 15 will have been cancelled). In this regard, Applicant respectfully traverses the rejection.

Amended independent claim 12 recites a solid-state imaging apparatus including unit pixels arranged in a two-dimensional array. Each unit pixel includes a light-collector and a light-receiver. The light-collector includes a substrate onto which incident light is incident. A plurality of light-transmitting films are formed above the substrate in a region onto which the incident light is incident. The light-transmitting films form a refractive index distribution and form a plurality of zones, each of which has a width shorter than or equal to a wavelength of the incident light. For each image pixel located in a center of an imaging area, a central axis of the light-receiver matches a central axis of the light-collector. For each unit pixel located in a periphery of the imaging area, the central axis of the light-collector is displaced from the central axis of the light-receiver toward the center of the imaging area. Furthermore, each of the light-transmitting films included in one of the unit pixels located in a center of the imaging area has a line width different from a line width of the light-transmitting film which is included in one of the unit pixels located in the periphery of the imaging area and which has the same relative position in the light-collector. Also, a sum of the line widths of the light-transmitting films included in the one of the unit pixels located in the center of the imaging area is different than a sum of the line widths of the light-transmitting films included in the one of the unit pixels located in the periphery of the imaging area.

According to a non-limiting and advantageous effect of the solid-state imaging apparatus as recited by amended independent claim 12, it is possible to increase a variation in effective refractive index in a unit pixel located in the periphery of the imaging area to allow most of the incident light to reach the light-receiver in the unit pixel, even if the incident light has a large incident angle. Thus, the sensitivity of the unit pixel located in the periphery of the imaging area is equal to that of a unit pixel located in the center of the imaging area. In other words, the solid-state imaging apparatus as recited by amended independent claim 12 produces the non-limiting and advantageous effect of freely changing a focal length of the light-collector by changing line widths of light-transmitting films included in a light-collector having an effective refractive index distribution, thereby realizing a solid-state imaging device having high uniformity in sensitivity.

Applicant respectfully submits that SUZUKI and TAMECHIKA, whether considered alone or together in any proper combination thereof, fail to disclose or render obvious at least the features of independent claim 12 of a solid-state imaging device including unit pixels arranged in a two-dimensional array, each of which includes a light-collector and a light-receiver, wherein the light-collector includes a plurality of light-transmitting films forming an effective refractive index distribution and a plurality of zones, each of which is equal to or shorter than a wavelength of incident light. Additionally, Applicant further submits that the combination of SUZUKI and TAMECHIKA fails to disclose or render obvious the feature of independent claim 12 of each of the plurality of light transmitting-film included in one of the unit pixels located in the center of the of the imaging area has a line width different from a line width of each

of the plurality of light-transmitting films which is included in one of the unit pixels located in the periphery of the imaging area and which has a same relative position in the light-collector. Furthermore, the combination of SUZUKI and TAMECHIKA is also submitted to fail to disclose or render obvious the feature of independent claim 12 of a sum of the line widths of the light-transmitting films included in the one of the unit pixels located in the center of the imaging area differs from a sum of the line widths of the light-transmitting films included in the one of the unit pixels located in the periphery of the imaging area.

To the contrary, SUZUKI merely discloses a solid-state image sensor including microlenses where the microlenses located in a periphery of an imaging area are displaced toward the center of the imaging area (*see* SUZUKI, Figs. 2 and 5). In other words, in accordance with Figures 3 and 5 of SUZUKI, the microlenses located in Blocks B, C, and D are displaced toward Block A. SUZUKI, however, does not appear to disclose that each of a plurality of the microlenses (which the Examiner appears to equate to the light-transmitting films of the present application) included in a unit pixel located in the center of the imaging area has a line width different than a line width of each of a plurality of microlenses included in a unit pixel located in the periphery of the imaging area in a same relative position. SUZUKI further does not appear to disclose that a sum of line widths of microlenses located in a central pixel differs from a sum of line widths of microlenses located in a peripheral pixel. Additionally, the Examiner has acknowledged, on page 4 of the outstanding Official Action, that SUZUKI fails to teach the feature of independent claim 12 of the light-transmitting films forming a plurality of

zones in which each zone is equal to or shorter than a wavelength of the incident light and forming an effective refractive index distribution.

Additionally, TAMECHIKA merely discloses a microscopic period structure equal to or shorter than a wavelength as a phase change structure for causing diffraction in a diffractive light-collector having a periodic phase change for causing the diffraction. As such, it is respectfully submitted that TAMECHIKA fails to cure the deficiencies of SUZUKI.

Accordingly, the combination of SUZUKI and TAMECHIKA cannot produce the non-limiting and advantageous effect of the solid-state imaging apparatus as recited by amended independent claim 12. That is, SUZUKI and TAMECHIKA cannot produce an increase in the variation in effective refractive index in the periphery of the imaging area to allow the sensitivity of the unit pixels located in the periphery of the imaging area to be made equal to that of the unit pixels located in the center of the imaging area, even if the incident light has a large incident angle. In addition, SUZUKI and TAMECHIKA neither disclose nor suggest that the focal length of the light-collector included in the unit pixel of the solid-state image sensor can be freely changed.

Therefore, at least in view of the above, it is respectfully submitted that the combination of SUZUKI and TAMECHIKA fail to render obvious amended independent claim 12, at least because amended claim 12 would not have been obvious over SUZUKI and TAMECHIKA to a person skilled in the art at the time of the invention. Accordingly, it is respectfully requested that the rejection of claim 12 be withdrawn and that claim 12 be indicated to be allowable in the next Official communication.

With respect to dependent claims 14 and 16 and new dependent claim 19, Applicant submits that these claims are all directly dependent from independent claim 12, which is allowable for at least the reasons discussed *supra*. Thus, these dependent claims are submitted to also be allowable for at least the reasons discussed *supra*. Furthermore, all dependent claims recite additional features which further define the present invention over the references of record.

### **35 U.S.C. § 103 Claim Rejections**

Claim 18 was rejected under 35 U.S.C. § 103(a) as being unpatentable over SUZUKI in view of TAMECHIKA, and further in view of U.S. Pat. Appl. Pub. No. 2004/0126934 to Itano et al. (hereinafter "ITANO"). Applicant respectfully traverses this rejection.

Amended independent claim 18 recites a solid-stage imaging apparatus substantially as set forth in amended independent claim 12, and further including the features of: a wiring layer that has an aperture above the light-receiver, on a light-outgoing side plane area of the light-collector; and a focal point of light collected by the light-collector that matches a central axis of the aperture of the wiring layer. In the outstanding Official Action, it is again asserted that the combination SUZUKI and TAMECHIKA renders obvious the features of independent claim as substantially set forth in independent claim 12. Thus, at least for the reasons set forth above, Applicant respectfully submits that SUZUKI and TAMECHIKA fail to render obvious each and every feature recited by amended independent claim 18, as similarly recited by amended independent claim 12. In this regard, it is submitted that ITANO fails to cure the

deficiencies of SUZUKI and TAMECHIKA as set forth above. Rather, ITANO is merely relied upon to allegedly disclose the features relating to the wiring layer.

Therefore, at least for the reasons set forth above for amended independent claim 12, Applicant respectfully submits that SUZUKI, TAMECHIKA, and ITANO, alone or in combination, fail to render obvious each and every feature recited by amended independent claim 18. Accordingly, Applicant respectfully requests withdrawal of the rejection and an indication of the allowability of amended independent claim 18 in the next Official communication.

At least in view of the above, Applicant submits that each and every pending claim of the present application (*i.e.*, claims 12, 14, 16, and 18-19) meets the requirements for patentability. Accordingly, it is respectfully requested that the outstanding objections and rejections are withdrawn and that each and every pending claim in the present application is indicated to be allowable.



### **CONCLUSION**

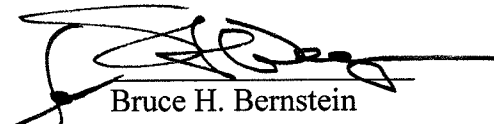
In view of the fact that none of the art of record, whether considered alone, or in any proper combination thereof, discloses or renders obvious the present invention as now defined by the pending claims, and in further view of the above amendments and remarks, reconsideration of the Examiner's action and allowance of the present application are respectfully requested and are believed to be appropriate.

Applicant notes that this amendment is being made to advance prosecution of the application to allowance, and should not be considered as surrendering equivalents of the territory between the claims prior to the present amendment and the amended claims. Further, no acquiescence as to the propriety of the Examiner's rejection is made by the present amendment. All amendments to the claims which have been made in this amendment, and which have not been specifically noted to overcome a rejection based upon the prior art, should be considered to have been made for a purpose unrelated to patentability, and no estoppel should be deemed to attach thereto.

Should the Commissioner determine that an extension of time is required in order to render this response timely and/or complete, a formal request for an extension of time, under 37 C.F.R. §1.136(a), is herewith made in an amount equal to the time period required to render this response timely and/or complete. The Commissioner is authorized to charge any required extension of time fee under 37 C.F.R. §1.17 to Deposit Account No. 19-0089.

If there should be any questions concerning this application, the Examiner is invited to contact the undersigned at the telephone number listed below.

Respectfully submitted,  
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